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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/991,341	11/16/2001	Chang Cheng Hung	67,200-435	3529

7590 11/16/2004

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EXAMINER	
CHAWAN, SHEELA C	
ART UNIT	PAPER NUMBER
2625	

DATE MAILED: 11/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/991,341	HUNG ET AL.	
	Examiner	Art Unit	
	Sheela C Chawan	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 November 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The Examiner has approved drawings filed on 11/16/01.

Specification

2. The disclosure is objected to because of the following informalities:

Page 12, line 20, change "my" to -- may --.

Appropriate correction is required.

Claim Rejections - 35 U.S.C. § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1- 5 are rejected under 35 U.S.C. 102(e) as being anticipated by Machida et al., (US. 6,476,913 B1).

As per claim 1, Machida discloses a method, comprising the steps of:

(a) searching (fig 36, searching the defect on photomask by the review SEM for 1021) a defect on a photomask (fig 32, 155 wafer on which circuit pattern is formed

which corresponds to photomask or reticle which is used for pattern formation in the field of semiconductor wafer by a lithography process, column 1, lines 27- 37, column 39, lines 40- 42) with a mask marking inspection system (note, fig 37, 1024 correspondence to mask marking inspection which is indicative of marking the position of defects on photomask by searching and reviewing the defect by the review SEM 1021, column 39, lines 40- 53, column 40, lines 21-34), the mask marking inspection system including a photomask inspection apparatus, and a mark installer (note, fig 36, external apparatus 1024a corresponds to mark installer, column 40, lines 21- 34) linked with the photomask inspection apparatus (fig 36, 1021 and 1024 are linked together, column 39, line 65 through column 40, line 34); and

(b) disposing a defect finder mark on the photomask with the mark installer (fig 36, 1021 SEM search for defects like foreign matter and pattern defect, or by marking the position of the pattern defect by the external device 1024a, column 39, line 65 through column 40, line 34).

As to claim 2, Machida discloses the method wherein the step of searching for a defect on a photomask includes the step of locating a defect on the photomask (fig 32, 155 wafer on which circuit pattern is formed which corresponds to photomask or reticle which is used for pattern formation in the field of semiconductor wafer by a lithography process, column 1, lines 27- 37, column 39, lines 40- 42).

As to claim 3, Machida discloses the method wherein the step of searching for a defect includes the step of searching for the defect about a dense pattern array of the photomask (note, searching the defects on circuit pattern which corresponds to dense

pattern, column 17, lines 16- 24, column 23, lines 24- 35).

As to claim 4, Machida discloses the method wherein the step of searching for a defect includes the step of searching for an elusive defect (note, the defect information under the wafer map corresponds to elusive defect, column 35, lines 26- 39).

As to claim 5, Machida discloses the method wherein the step of disposing a defect finder mark on the photomask includes the step of establishing a location of the defect finder mark that is adjacent to the defect (column 2, lines 20 –29, column 6, lines 16-22).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Claims 6 - 9, 12-20, are rejected under 35 U.S.C. 103(a) as being unpatentable over Machida et al., (US. 6,476,913 B1), as applied to claims 1- 5 above and further in view of Higashikawa (US. 6,765,673 B1).

Regarding claim 6, Machida discloses method and apparatus for inspecting a photomask, a reticle, a liquid crystal, and a fine circuit pattern of a semiconductor device, wherein the step of disposing a defect finder mark on the photomask includes the step of establishing a size for the defect finder mark so that the defect finder mark is detected (column 36, lines 26- 29, column 39, lines 40- 53, column 40, lines 20- 34). Machida also discloses manufacturing process of a semiconductor device, such as wafer deposition, surface oxidation, a film deposition, a photosensitive resist coating, a development, etching, a resist removal and cleaning step. Machida is silent about a mask repair device.

Higashikawa discloses a method of forming a fine pattern of LSI by exposing an original plate such as a photomask to light. For example, in the case of a mask blank having a light shielding film formed on a transparent substrate, a black type defect is buried in the light shielding film pattern, and a white type defect is exposed to a pattern opening in which the light shielding pattern is not present so as to make these defects invisible when a mask is prepared. Also, if the defect is not positioned in a contour portion of the pattern, the defect can be corrected easily by, a laser repairing apparatus (column 3, lines 1- 11, column 7, lines 4 - 13, column 8, lines 1- 14).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Machida to include a mask repair device. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Machida by the teaching of Higashikawa in order to perform a defect

inspection and repair to eliminate the defect in a manner to satisfy the defect supervising standard and also to improve manufacturing yield and an effective utilization of the substrate such as mask blank (as suggested by Higashikawa at column 1, lines 25- 27, 63- 67).

As to claims 7 and 19, Machida discloses the method further comprising the step of searching for the defect finder mark on the photomask (column 39, lines 40- 53, column 40, lines 20- 34). Machida also discloses manufacturing process of a semiconductor device, such as wafer deposition, surface oxidation, a film deposition, a photosensitive resist coating, a development, etching, a resist removal and cleaning step. Machida is silent about a mask repair device.

Higashikawa discloses a method of forming a fine pattern of LSI by exposing an original plate such as a photomask to light. For example, in the case of a mask blank having a light shielding film formed on a transparent substrate, a black type defect is buried in the light shielding film pattern, and a white type defect is exposed to a pattern opening in which the light shielding pattern is not present so as to make these defects invisible when a mask is prepared. Also, if the defect is not positioned in a contour portion of the pattern, the defect can be corrected easily by a laser repair apparatus (column 3, lines 1- 11, column 7, lines 4 - 13, column 8, lines 1- 14).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Machida to include a mask repair device. It would have been obvious to one of ordinary skill in the art at the time of the invention to have

modified Machida by the teaching of Higashikawa in order to perform a defect inspection and repair to eliminate the defect in a manner to satisfy the defect supervising standard and also to improve manufacturing yield and an effective utilization of the substrate such as mask blank (as suggested by Higashikawa at column 1, lines 25- 27, 63- 67).

As to claim 8, Higashikawa discloses the method further comprising the step of repairing the defect with the mask repair device (column 3, lines 1- 11, column 7, lines 4 - 13, column 8, lines 1- 14).

As to claims 9 and 20, Machida discloses the method further comprising the step of eliminating the defect finder mark from the photomask (column 39, lines 40- 53, column 40, lines 20-34, column 41, lines 4-15).

Regarding claim 12, claim 12, recites similar limitation as claim 1 above and similarly analyzed. Machida discloses method and apparatus for inspecting a photomask, a reticle, a liquid crystal, and a fine circuit pattern of a semiconductor device. Machida also discloses manufacturing process of a semiconductor device, such as wafer deposition, surface oxidation, a film deposition, a photosensitive resist coating, a development, etching, a resist removal and cleaning step. Machida is silent about a back-end method for photo masking and repairing the defect on the photomask.

Higashikawa discloses a method of forming a fine pattern of LSI by exposing an original plate such as a photomask to light. Higashikawa discloses back-end method for photomask as follow (first, to reduce or eliminate number of defects on wafer substrate created from the photomask with photolithography process, column 1, lines

21- 28, second, developing treatment was applied followed by applying a dry etching treatment and then stripping off the resist pattern, and after a washing treatment the defect was inspected. The black types of defect were isolated defects that can be removed by applying a laser repair apparatus to the photomask (column 3, lines 1- 11, column 7, lines 4 - 13, column 8, lines 1- 14). Further, after a washing treatment a pellicle was mounted no defect that was considered to be derived from the photomask was detected, and the mask was found to be free from a defect, column 7, line 63 through line 14).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Machida to include back-end method and repairing the defect on the photomask. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Machida by the teaching of Higashikawa in order to perform a defect inspection and repair to eliminate the defect in a manner to satisfy the defect supervising standard and also to improve manufacturing yield and an effective utilization of the substrate such as mask blank (as suggested by Higashikawa at column 1, lines 25- 27, 63- 67).

As to claim 13, Higashikawa discloses the back-end method further comprising the step of cleaning the photomask (column 5, lines 13-22, column 7, lines 62- 67, column 8, lines 4-14).

As to claim 14, Higashikawa discloses the back-end method comprising the step of applying pellicle to the photomask (column 8, lines 7-14).

As to claim 15, Machida discloses the method wherein the step of searching for a defect includes the step of searching for the defect about a dense pattern array of the photomask (note, searching the defects on circuit pattern which corresponds to dense pattern, column 17, lines 16- 24, column 23, lines 24- 35).

As to claim16, Machida discloses the method wherein the step of searching for a defect includes the step of searching for an elusive defect (note, the defect information under the wafer map corresponds to elusive defect, column 35, lines 26- 39).

As to claim and 17, Machida discloses the method wherein the step of disposing a defect finder mark on the photomask includes the step of establishing a location of the defect finder mark that is adjacent to the defect (column 2, lines 20 –29, column 6, lines 16-22).

As to claim 18, see the rejection of claim 6 above.

5. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Machida et al., (US. 6,476,913 B1), in view of Higashikawa (US. 6,765,673 B1), as applied to claims 1-9, 12-20 above and further in view of Grenon et al., (US. 6,190,836 B1).

Regarding claim 10, Machida discloses method and apparatus for inspecting a photomask, a reticle, a liquid crystal, and a fine circuit pattern of a semiconductor device, wherein the step of eliminating the defect includes depositing a filling agent on the defect finder mark. Machida also discloses manufacturing process of a semiconductor device, such as wafer deposition, surface oxidation, a film deposition, a

photosensitive resist coating, a development, etching, a resist removal and cleaning step. Machida is silent about deposition a filling agent on the defect finder mark.

Grenon discloses a method of repairing defects in photomasks and the use of a coating on a photomask during steps to repair cleans and opaque defects on photomask by the use of short duration laser pulses to repair opaque defets on photomask. The system comprises of:

wherein the step of eliminating the defect includes depositing a filling agent on the defect finder mark (note, filling agent corresponds to carbon, column 4, lines 55- 67, column 5, lines 57- 62, column 10, lines 55- 65).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Machida to include deposition a filling agent on the defect finder mark. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Machida by the teaching of Grenon in order to provide a more reliable method of correcting opaque and clear defects on photomasks (as suggested by Grenon at column 3, lines 40- 44).

As to claim 11, Grenon discloses the method further including the step of forming a photoresist image on a wafer substrate with the photomask (column 5, lines 25- 38, 57- 65).

Other prior art cited

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Tarabocchia (US.3,748,975) discloses apparatus for and method of correcting a defective photomask.

Pierrat et al., (US.6,373,976 B1) discloses method and apparatus to accurately correlate defect coordinates between photomask inspection and repair systems.

Fiekowsky (US.6,263,292 B1) discloses high accuracy particle dimension measurement system.

Nagamura et al., (US. 6,340,543 B1) discloses photomask, manufacturing method thereof, and semiconductor device.

Pierrat et al. , (US.6,091,845) discloses inspection technique of photomask.

Levy et al., (US.4,247,203) discloses automatic photomask inspection system and apparatus.

Contact Information

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sheela C Chawan whose telephone number is 703-305- 4876. The examiner can normally be reached on Monday - Thursday 8 - 6.30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on 703-308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SCC

Sheela Chawan
Patent Examiner
Group Art Unit 2625
November 10, 2004